Limited Visual Dam Safety Inspections

OA00023

Helemano 6 Reservoir

Oahu, Hawaii

Prepared by:

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

May 2006

Dam ID: OA-023
Name: Helemano 06 Reservoir

Limited Visual Dam Safety Inspection Conducted on: 3 April 2006

I. Purpose:

Due to disaster occurrences of periodic heavy rains and flooding, which has caused extensive damage to property and loss of lives, the Governor has issued a State of Emergency Proclamation extending from February 20, 2006 to April 9, 2006. In light of the tragic failure of the Kaloko dam on Kauai and the continued forecast of heavy rains, emergency inspections of all regulated dams in all counties are being undertaken.

These inspections are for the purpose of determining if any of the regulated dams and reservoirs in the City and County of Honolulu, Maui County or Hawaii County, are suspect for immediate concern to the downstream area under the prolonged conditions of heavy rain showers.

II. Authority

Inspections were authorized under the Hawaii Dam Safety Act of 1987, Chapter 179D "Dams and Reservoirs" of Hawaii Revised Statues, and Title 13, Subtitle 7, Chapter 190, "Dams and Reservoirs" of the Hawaii Administrative Rules.

These inspections were conducted under joint agreements of the U.S. Army Corps of Engineers (ACE), the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), and the State of Hawaii. The Memorandum of Agreement with the U.S. Army Corps of Engineers is entered into pursuant to 10 U.S.C. § 3036(d)(2), and the Intergovernmental Cooperation Act (31 U.S.C. §6505), and established via support agreement number DL-06-01.

III. Scope

Visual inspection was performed on parts of the embankment and appurtenant works readily available and visible for inspection by the inspection team at the time of the inspection. Such parts and appurtenant works included the upstream slope, crest, downstream slope, abutments and toes, outlet works, and spillway.

On the date of this limited visual inspection, there may or may not have appeared to be any immediate threat to the safety of the dam, however no assurance can be made regarding the dam's condition after this date. Subsequent adverse weather and other factors may affect the dam's condition.

IV. Limitations of Findings and Recommendations

The inspection is based only on visible features/areas of the dam on the day of inspection. The inspection does not entail detailed stability, hydrologic, hydraulic, or seismic investigations. This inspection is not a formal phase I or phase II dam safety inspection and does not include a review or evaluation from each specialist of an inspection team, such as a geologists, civil, geotechnical, structural, or hydraulics engineer. The owner should verify the findings of this report and take corrective actions. The owner may submit to the State alternative corrective actions that are certified by a licensed professional engineer in the State of Hawaii experienced in the design and construction of dams. This inspection does not relieve the owner/operator from their responsibility to conduct routine inspections, maintenance, repairs, modifications, monitoring, documentation, and/or investigative studies.

Dam ID: OA-023
Name: Helemano 06 Reservoir

V. Inspection Team

Organization	Name
State of Hawaii, Dept. of Land and Natural Resources	Carty Chang
National Resource Conservation Service	Mike Hayama
U.S. Army Corps of Engineers	Ray Kong

VI. Owner's Representatives Present

Mr. Gary Parcellus representing Dole Food, Inc.

VII. Inspection Team

Organization	Name
U.S. Army Corps of Engineers	Mr. Derek Chow
	Mr. Joseph Koester
State of Hawaii, Dept. of Land and Natural Resources	Ms. Denise Manuel
	Mr. Edwin Matsuda

VIII. Dam Type

The dam is an earthen embankment.

IX. Dam Classification

The current hazard classification of this dam is: Significant
Based on available data, this classification is believed to still be applicable.

Hazard Potential Classification based on the following:

Category	Loss of Life	Economic Loss
Low	None Expected	Minimal (undeveloped to occasional structures or agriculture)
Significant	Few (No Urban development and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than a few	Extensive community, industry or agriculture.

Based on inventoried storage and height data, the size classification of the dam is: Small

Size Classification based on the following:

Category	Storage (Acre-Feet)	Height (feet)
Small	< 1000	< 40
Intermediate	> 1000 and < 50,000	> 40 and < 100
Large	> 50,000	> 100

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X. Summary of Inspection:

Condition Rating Criteria: The conditional terms in this report are used to generally described the conditions below. Inspections, monitoring, and additional investigations are considered to be incidental to all condition ratings.

Satisfactory	Expected to fulfill intended function.
Fair	Expected to fulfill intended function, but maintenance is recommended.
Poor	May not fulfill intended function; maintenance or repairs are necessary.
Unsatisfactory	Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
Unknown	Not visible, not accessible, not inspected, or unable to determine the condition rating based on the observation taken.

A. General appearance:

The reservoir and dam features were generally accessible for inspection.

Modifications / Improvements: There were no signs of any recent modifications. The reservoir appeared to have a small surface drainage area.

Based on staff personnel, this reservoir has no history of incidents.
(Breached, Overtop, Slide, Down stream Flooding)

Findings and Corrective Actions:

a. The Owner shall maintain documentations including improvements, modifications, Operations and Maintenance Manuals and routine inspection logs for this dam facility.
b. An EAP is recommended for all dams regardless of hazard class. Submit EAP if developed for the facility.
c. Submit narrative and additional information detailing known past improvements, modifications, and/or alterations at the dam site, unless covered by approved dam permit.
d. Routine inspection logs were not inspected.
e. Dam owners shall provide for routine inspection of the dam.
f. The dam did not appear to be maintained on a regular basis.
g. Access to site appears to be satisfactory.
h. Dam owners are required to promptly advise the department of any sudden or unprecedented flood or unusual or alarming circumstance or occurrences which may adversely affect the dam or reservoir.
i. Submit current Operations and Maintenance Manual or Procedures for this dam / reservoir facility.
j. Submit Site or Facility Map of this Dam which identifies the location of major features including outlet works controls and conduits.

k. Emergency Alarms / Monitors. There were no alarms or monitors observed on this reservoir.
l. Power / Communication. There were no communication systems observed on this reservoir.

B. Access / Security:

Access to the dam was accomplished via a County roadway.
A four wheel drive vehicle is not required.

Security issues. Valves are locked. Access to the dam is via gates.

C. Inflow Works:

According to staff personnel, there are 2 inlets feeding the reservoir, one from the Helemano 16 reservoir (3 feet by 3 feet) and the other from the Wahiawa reservoir (5 feet by 4 feet). These are via a culvert and flume.

The inflow works have the ability to be shut off or diverted away from the reservoir during periods of heavy rains. This is done manually.

Findings and Corrective Actions:

a. The inflow works were inspected only for the short section leading into the reservoir.
b. The inflow works were not tested.
c. The intake works appeared to be in satisfactory condition, no corrective actions are required at this time.

D. Reservoir

The reservoir level during the inspection was about 10 feet from the crest elevation. According to staff personnel, the reservoir is normally operated at the level observed during the inspection.

Findings and Corrective Actions:

a. The reservoir was not fully inspected due to obstruction by heavy vegetation and major portions of the reservoir covered by water.
b. The reservoir appeared to be in satisfactory condition, no corrective actions are required at this time.
c. A staff gage was not observed at the reservoir. Provide some method of quantifying the water level within the reservoir.

E. Upstream Slope (Fair)

The upstream slopes stood at about 1V:1H (Vertical/Horizontal) or flatter.
There was no slope protection observed.
Ruts and gullies produced by erosions were observed.
Cracks were not observed. Sinkholes were not observed.

Findings and Corrective Actions:

a. The upstream slope appeared to be in fair to poor condition and requires corrective action.
b. Slope protection needs maintenance or repair. Description: Slope steeper than 1:1 needs checking.
c. Rut and/or Gully erosion were observed on the slope, which requires maintenance and/or repair. Description: The gullies are parallel to the slope indicating erosion by runoff, these are likely to get deeper and wider.

F. Crest: (Satisfactory)

The dam crest was approximately 24 feet wide
There was a dirt/gravel surfaced access road on top of the crest which appeared to be well utilized.
Minor erosion was observed, limited primarily to tire ruts and some small gullies from surface drainage flowing down the downstream slope.

Findings and Corrective Actions:

a. The dam crest appeared to be in satisfactory condition, no corrective actions are required at this time.

G. Downstream Slope: (Fair)

The slope was very steep, around a 1 to 1 slope.
There was no slope protection observed on the downstream slope.
Erosion was observed on the downstream slope.
Vegetation was observed on the downstream slope. The majority of the vegetation was tall grass.
Seepage was not observed on the downstream toe.

Findings and Corrective Actions:

a. The downstream slope appeared to be in fair to poor condition and requires corrective action.
b. Slope protection needs maintenance or repair. Description: Require low lying grass to protect slope from erosion.
c. Rut and/or Gully erosion was observed on the slope, which requires immediate repair. Description: Deep gullies running parallel to the slope.
d. The slope was very steep, around a 1 to 1 slope, further study is required to verify slope stability.

H. Abutments / Toe: (Fair)
Erosion along the abutment and toe was observed.

Findings and Corrective Actions:
a. The abutments/toe appeared to be in fair to poor condition and requires corrective action.
b. Slope protection needs maintenance or repair. Description: Provide grass protection.
c. Rut and/or Gully erosion was observed, which requires maintenance and/or repair. Description: Gullies appear at both groins.
d. The abutment/toe area was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

I. Outlet Works: (Satisfactory)
Not inspected in detail, not tested.
The outlet works is controlled via a gate valve on the upstream side of the dam.
Seepage was not observed flowing near the exit of the outlet works from the dam.

Findings and Corrective Actions:
a. The outlet works were not tested.
b. The outlet works appeared to be in satisfactory condition, no corrective actions are required at this time.

J. Spillway: (Fair/Poor)
The rough dimensions were 10 feet by 10 feet.
The spillway channel then feeds a drainage swale that runs toward the left embankment and then head downstream.

The spillway approach was clear but the right wingwall is missing.
Further investigations should be conducted to conclude the capacity of the spillway.

Findings and Corrective Actions:
a. The Spillway appeared to be in fair to poor condition and requires corrective action.
b. Slope protection needs maintenance or repair. Description: Provide protection against erosion observed.
c. Severe scour erosion was observed which requires maintenance and/or repair. Description: Deep erosion seen at the approach, headwall, downstream beyond the lined section.
d. A headcut was observed downstream of the spillway. Corrective / mitigative action is required to prevent this problem from moving upstream.
e. Unclear if spillway is adequately sized. Spillway should pass the probable maximum flood. Verify spillway capacity and take corrective action as required.
f. Monitor dry erosion.

K. Down Stream Channel: (Unknown)
a. The down stream channel was not investigated / inspected.

XI. Additional Comments:

Original field inspection notes were scanned and are attached to this summary report. Included are photos from the site visit to detail important features of the project, captioned to be self-explanatory.

Per e-mail dated 5/12/06, 3:47 pm from Ray Kong, USACE

Please describe vehicle access to site: Standard car okay
Please describe access during rains: Recommend 4-wheel drive.
Please describe access when spillway is flowing: Depends on weather. Standard car usually, 4-wheel drive during heavy rains.

Reservoir: Please indicate the level of the reservoir during inspection.
About 10 feet from the crest.
Please indicate the typical operation level. This level is the usual operating level.
Please indicate if any sinkholes were observed None observed.
Please indicate if a staff gage was observed, and if a staff gage was observed where was it at the time of inspection? If none, please indicate corrective action. No staff gage observed therefore this is an action item for the owner to install.

Intake Works: Please describe the control of the intake works. Gated.

Crest: Please indicate the access of the crest: Driveway on crest

Downstream slope: Please indicate vegetation and seepage information. Tall grass and bushes. No seepage observed.

Outlet works: Please indicate the size of the PVC pipe and culvert. No measured, about 12" pipe and culvert 24" by 24".

Downstream channel: Please describe if the downstream channel: Undefined drainageway at spillway and otherwise not inspected.
Please indicate items along the stream bank: Not inspected.

Comments: Please indicate if the dam presented a safety hazard at the time of inspection. Also please comment to the owner about the erosion at downstream slope and the spillway. Should it be corrected immediately (within 6 months)? Would it be in their best interest to have a structural or geotechnical engineer assist them with the corrective action(s)? No immediate threat to the dam structure was observed on the date of inspection. The erosion gully should be repaired immediately and surface water diverted away from the downstream slope.

PHOTOGRAPHS

Dam ID: OA-023
Name: Helemano 06 Reservoir

View of reservoir, 1 of 2

View of reservoir, 2 of 2

Dam ID: OA-023
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View of upstream slope

Another view of the upstream slope

Dam ID: OA-023
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View of downstream slope

Another view of downstream slope, notice erosion gullies

Dam ID: OA-023
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Looking downstream at spillway, notice missing wing wall and erosion at headwall

Looking at the spillway (upstream) from the abutment

Dam ID: OA-023
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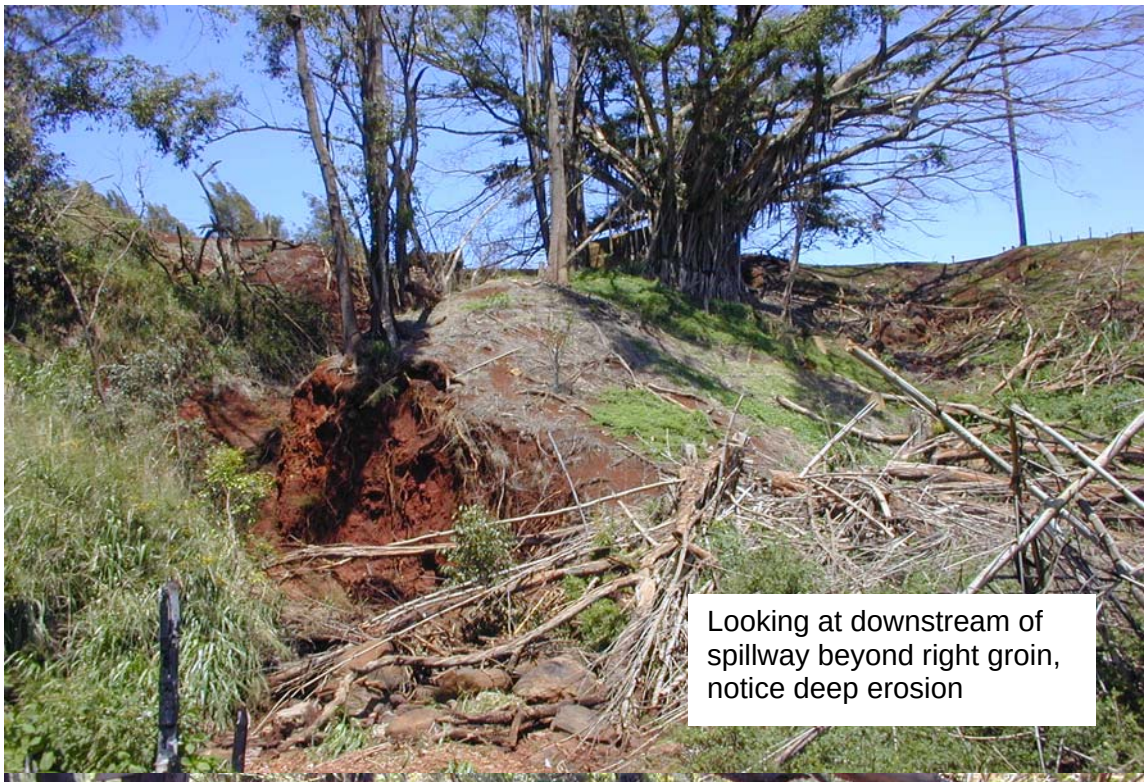

Looking at downstream of spillway beyond right groin, notice deep erosion

Looking beyond spillway concrete lining downstream, notice erosion

Dam ID: OA-023
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Inflow works

View of intake for the outlet works

Dam ID: OA-023
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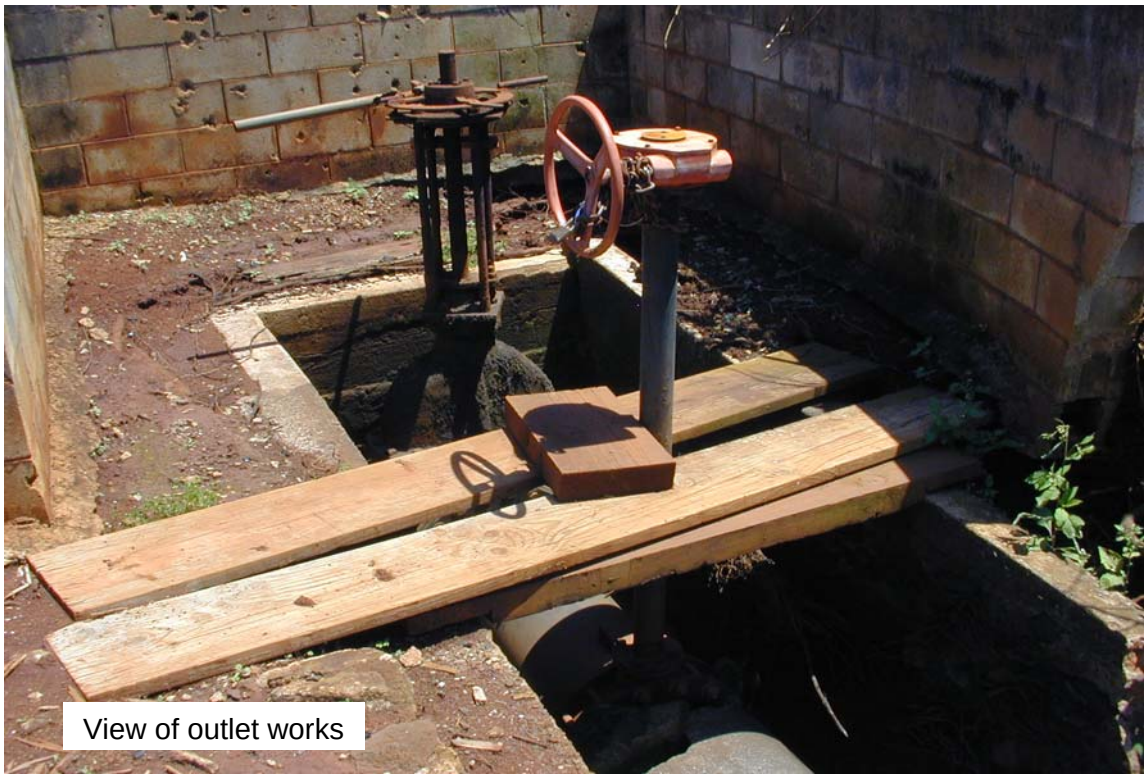

View of outlet works

FIELD INSPECTION SHEETS

Dam ID: OA-0023
HELEMANO 6 RESERVOIR

Vulnerability Index:
Extreme 1 | High 2 | Moderate 3 | Low 4

Inspection No:
Date: 3 Apr. 2006

STATE OF HAWAII - DLNR
DAM SAFETY INSPECTION SHEET

Inspection Type: Visual Dam Safety Inspection

Persons Present	Affiliation	Phone Number
RAY KONG	US Army Corps of Engineers	
CARTY CHANG	DLNR	
MIKE HAYAMI	NRCS	
GARY PARCELLAS	DOLE FOODS	

Weather Condition: ☐ Rain previous day ☐ Rainy ☐ Drizzle / Mist ☐ Cloudy/Overcast ☐ Partly Cloudy ☑ Sunny ☐ Dry

Comments:

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1. General: *(Information currently on file, update as required)*

Dam/Res. Name	HELEMANO 6 RESERVOIR		
Owner	Dole Food Company Hawaii		*(C005)*
Owner Contact	Mr. Gary Paracuellas	Owner Ph.	
Lessee		Lessee Ph.	
O & M Contractor		O & M Ph.	
Nearest Town	KEMOO CAMP 4	Latitude	21.54° (decimal)
County	HONOLULU	Longitude	158.0683° (decimal)
Tax Map Key(s)	(1)6-4-003:001		

Dam Status	A:	Hazard Potential	S:	Dam Size	
Year Completed	1915	Dam Length	25 ft.	Dam Height	30 ft.
Normal Storage	66 ac.ft.	Max. Storage	30 ac.ft.	Max. Surface Area	0 ac.
Drainage Area	0 mi.	Spillway Type		Max. Spillway Q	0 cfs

Owner owns land under dam facility:
Emergency Action Plan on file with the Department: NO
Reports on file with the Department: December 1996 = RMTC, Phase I Study (Only Original)

Dam ID: OA-0023
HELEMANO 6 RESERVOIR

Inspection No: _____
Date: 04/23/06

2. Questions for Owner's Rep.:

	Yes	No	Unknown	Comments
Construction Plans Available	☐	☑	☐	
Site / Facility Map	☐	☑	☐	
Operation & Maintenance Manual	☐	☑	☐	
Emergency Action Plan	☐	☑	☐	
Modifications / Improvements	☐	☑	☐	
Conduct Routine Inspections	☑	☐	☐	
Conduct Routine Maintenance	☑	☐	☐	
Vehicle access to site	☑	☐	☐	☐ Not accessible ☐ With Standard car ☐ Requires 4-Wheel Drive
Access during heavy rains	☑	☐	☐	☐ Not accessible ☐ With Standard car ☐ Requires 4-Wheel Drive
Access when spillway is flowing	☑	☐	☐	☐ Not accessible ☐ With Standard car ☐ Requires 4-Wheel Drive
Other Studies Conducted	☑	☑	☐	☑ Phase I ☐ Phase II ☐ Hydraulics ☐ Stability ☐ Hazard ☐ Seismic ☐ Other: _____
Incident History	☐	☑	☐	☐ Breached ☐ Overtop ☐ Slide ☐ Down stream Flooding ☐ Other: _____
Reservoir's Current Use	☑	☐	☐	☐ Sediment ☑ Irrigation ☐ Recreation ☐ Flood Control ☐ Drinking Water ☐ Power Generation ☐ Other: _____

Findings and Corrective Actions:

- ☑ a. The Owner shall maintain documentations including Construction plans, specifications, improvements, modifications, Operations and Maintenance Manuals and routine inspection logs for this dam facility. 4/23/06
- ☐ b. An Emergency Action Plan (EAP) is on file with the department, submit any updates as applicable.
- ☐ c. An EAP is required for High Hazard Dams. Submit an updated EAP for this facility.
- ☑ d. An EAP is recommended for all dams regardless of hazard class. Submit EAP if developed for the facility. 4/23/06
- ☐ e. Submit narrative and additional information detailing the improvements, modifications, and/or alterations at the dam site, unless covered by approved dam permit.
- ☑ f. Routine inspection logs were not inspected.
- ☑ g. Dam owners shall provide for routine inspection of the dam.
- ☐ h. The dam did not appear to be maintained on a regular basis.
- ☐ i. Access to site appears to be satisfactory.
- ☐ j. There is no vehicular access to the dam site. Operational and emergency plans need to reflect this deficiency or access provided.
- ☐ k. Access to dam is questionable during severe weather conditions and/or spillway overflows. Operational plans and emergency plans need to reflect this deficiency or access provided.
- ☐ l. Provide a detailed narrative of the incident, responses taken, and any damages incurred. Dam owners are required to promptly advise the department of any sudden or unprecedented flood or unusual or alarming circumstance or occurrences which may adversely affect the dam or reservoir.
- ☑ m. Submit current Operations and Maintenance Manual or Procedures for this dam / reservoir facility. 4/23/06
- ☑ n. Submit Site or Facility Map of this Dam which identifies the location of major features including outlet works controls and conduits. 4/23/06
- ☐ o. _____

Additional Requirements:

The following investigative study(s) are:

Required	Recommended	
☐	☐	Phase I Study
☐	☐	Phase II Study (Including ☐ Seepage ☐ Hydrology/Hydraulics ☐ EAP)
☐	☐	Hydrology and Hydraulics (including Probable Maximum Flood and spillway capacity)
☐	☐	Stability Analysis
☐	☐	Seismic Analysis
☐	☐	Hazard Classification
☐	☐	Other: _____

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HELEMANO 6 RESERVOIR

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Date: 04/03/06

Physical Dam Features: (Check All Applicable. Provide description of Items Observed and/or Take Photos. Indicate photo # in description.)

3. Reservoir:

Level during inspection _____ ft per _____ (gage / other)

Normal Operating Level/Range ~10 ft per _____ (gage / other) from crest

Description: _____

Typical Operation ☐ Spillway always flowing ☐ Kept within normal range ☐ Kept Empty ☐ Drained Daily ☐ Only filled by Storms

☐ Other: _____

Sinkhole in Res.: ☐ # Observed: _____ Size: _____ by _____ in. Deep ☐ Not Visible ☐ None Observed

Description: _____

Staff Gage: Description: _____

Findings:

☐ a. The reservoir was not inspected.
☑ b. The reservoir appeared to be in satisfactory condition, no corrective actions are required at this time.
☐ c. The reservoir appeared to be in fair to poor condition and requires corrective action.
☐ d. The reservoir appeared to be in unsatisfactory condition, urgent corrective action is required.

Corrective Actions:

☐ e. The staff gage needs maintenance and/or repair. Description: _____
☐ f. A staff gage was not observed at the reservoir. Provide some method of quantifying the water level within the reservoir.
☐ g. A sinkhole was observed in the upstream reservoir. Conduct additional investigations and monitoring to identify the cause, risk and appropriate action.
☐ h. _____

4. Intake Works Description:

☑ Number of Intakes 2

☑ Intake Culvert / Pipe
Size: 5'x4' in. ☐ DIP ☐ Corrugated Metal ☐ PVC ☐ HDPE ☐ Concrete ☐ Other 3'x3' box culvert
Control: ☑ Gate ☐ Valve ☐ Flow can either be Shut off or Bypassed
From: ☐ Stream Diversion ☐ Pump ☐ Reservoir ☐ Other Wahiawa reservoir

☑ Ditch / Flume
Dimension: 3'x3' (Size x Depth) Shape U-shaped
Surface: ☑ Dirt ☐ Wood ☑ Concrete ☐ Lined w/ _____
Control: ☐ Gate ☐ Valve ☐ Flow can either be Shut off or Bypassed
From: ☐ Stream Diversion ☐ Pump ☐ Reservoir ☐ Other Helemano 16 reservoir

Findings:

☐ a. The intake works were not inspected.
☐ b. The intake works were not tested.
☑ c. The intake works appeared to be in satisfactory condition, no corrective actions are required at this time.
☐ d. The intake works appeared to be in fair to poor condition and requires corrective action.
☐ e. The intake works appeared to be in unsatisfactory condition, urgent corrective action is required.

Corrective Actions:

☐ f. The intake works needs maintenance and/or repair. Description: _____
☐ g. _____

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5. Upstream Slope: (Typical Slope ± 1V : 1H)

Slope Protection: ☑ None ☐ Dumped Rock ☐ Fitted Rip Rap ☐ Grouted Rip Rap ☐ Liner _____ ☐ Other: _____
☐ Defect in Protection: Description: _____

Erosion: ☐ Loose soil w/ little vegetation ☑ Rut (<6") ☐ Gully (>6" deep) ☐ Not Visible ☐ None Observed
Description: _____

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible ☑ None Observed
Description: _____

Sinkholes: ☐ # Observed: _____ Size: _____ and _____ Depth ☐ Not Visible ☑ None Observed
Description: _____

Vegetation: ☑ None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"
Description: _____

Findings:

- ☐ a. The upstream slope was not inspected.
- ☐ b. The upstream slope appeared to be in satisfactory condition, no corrective actions are required at this time.
- ☑ c. The upstream slope appeared to be in fair to poor condition and requires corrective action.
- ☐ d. The upstream slope appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

- ☑ e. Slope protection needs maintenance or repair. Description: slope steeper than 1:1, needs checking
- ☐ f. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: _____
- ☐ g. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- ☐ h. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.
- ☐ i. The upstream slope was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- ☐ j. Tree(s) were observed on the dam embankment. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- ☐ k. _____

Dam ID: OA-0023
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Inspection No: _____
Date: 04/03/04

6. Crest: Approximate Crest Width: ~24'

Access: ☐ None ☐ Walking Path ☐ Roadway, Surface / Width / Usage: _____

Erosion: ☑ Loose soil w/ little vegetation ☑ Rut (<6") ☐ Gully (>6" deep) ☐ Not Visible ☐ None Observed
Description: _____

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible ☑ None Observed
Description: _____

Sinkholes: ☐ _____ in. Wide x _____ in. Long x _____ in. Deep ☐ Not Visible ☑ None Observed
Description: _____

Vegetation: ☑ None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"
Description: _____

Findings:

☐ a. The dam crest was not inspected.
☑ b. The dam crest appeared to be in satisfactory condition, no corrective actions are required at this time.
☐ c. The dam crest appeared to be in fair to poor condition and requires corrective action.
☐ d. The dam crest appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Access along the crest was satisfactory.
☐ f. Access along the crest was not possible. Description: _____
☐ g. Rut and/or Gully erosion was observed on the crest, which requires maintenance and/or repair. Description: _____
☐ h. A crack was observed on the crest, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
☐ i. A sinkhole was observed on the crest, which requires further investigation to determine the underlining cause. Repair and monitor the area.
☐ j. Portions of the crest were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
☐ k. Tree(s) were observed along the dam crest. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
☐ l. _____

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Date: 04/03/06

7. Downstream Slope: (Typical Slope ± 1V : 1H)

Access: ☐ lower roadway along toe ☐ roadway to outlet works ☑ walkway to outlet works ☐ None Observed

Slope Protection: ☑ None ☐ Dumped Rock ☐ Rip Rap ☐ Grouted Rip Rap ☐ Concrete

Erosion: ☐ Loose soil w/ little vegetation ☑ Rut (<6") ☑ Gully (>6" deep) ☐ Not Visible ☐ None Observed

Description: Deep gully cutting into slope

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible ☑ None Observed

Description: _____

Sinkholes: ☐ _____ in. Wide x _____ in. Long x _____ in. Deep ☐ Not Visible ☑ None Observed

Description: _____

Vegetation: ☐ None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: _____

Seepage:

Seep Spot Number 1

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible ☐ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Seep Spot Number 2

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible ☐ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

☐ a. The downstream slope was not inspected.

☐ b. The downstream slope appeared to be in satisfactory condition, no corrective actions are required at this time.

☑ c. The downstream slope appeared to be in fair to poor condition and requires corrective action.

☐ d. The downstream slope appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Slope protection needs maintenance or repair. Description: _____

☑ f. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: Fill in gully and divert runoff away from downslope immediately

☐ g. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.

☐ h. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.

☐ i. The down stream slope was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

☐ g. Tree(s) were observed on the downstream slope. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.

☐ h. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.

☐ i. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.

☐ j. The slope was very steep, around a 1 to 1 slope, further study is required to verify slope stability.

☐ k. _____

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8. Abutments/Toe:

Erosion: ☑ Loose soil w/ little vegetation ☑ Rut (<6") ☑ Gully (>6" deep) ☐ Not Visible ☐ None Observed
Description: at right groin, towards left groin

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible ☑ None Observed
Description: _____

Vegetation: ☐ None ☐ Low Ground Cover ☑ Bushes or Tall Grass ☑ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"
Description: _____

Seepage:
Seep Spot Number 1
☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible ☑ None Observed
☐ Flowing, Description: _____
Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____
Description: _____

Seep Spot Number 2
☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible ☐ None Observed
☐ Flowing, Description: _____
Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____
Description: _____

Findings:

☐ a. The abutments/toe were not inspected.
☑ b. The abutments/toe appeared to be in satisfactory condition, no corrective actions are required at this time.
☑ c. The abutments/toe appeared to be in fair to poor condition and requires corrective action.
☐ d. The abutments/toe appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. Slope protection needs maintenance or repair. Description: _____
☑ f. Rut and/or Gully erosion was observed, which requires maintenance and/or repair. Description: Fill in ~~gully~~ gullies including gully adjacent to access rd.
☐ g. A crack was observed along the abutments/near the toe, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
☑ h. The abutment/toe area was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection. 4/23/06 ROMOO Em.
☐ i. Tree(s) were observed along the abutment/toe. Trees have been identified as the probably cause of piping failures, and can possibly cause sever damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. Acceptable remedies include removal of the tree and its root structure down to a 2" diameter and reconstructing the damaged embankment section. All repair work shall be accomplished as per the requirements of licensed geotechnical or structural engineer. Routinely monitor the damaged area for signs of settlement and seepage.
☐ j. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
☐ k. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.
☐ l. _____

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9. Outlet Works:

Culvert / Pipe (both)

Type / Size: _____

Culvert: ☑ Concrete ☐ Masonry ☑ unlined earth ☐ Other throw away water

Pipe: ☐ DIP ☐ Corrugated Metal ☑ PVC ☐ HDPE ☐ Concrete ☐ Other irrigation water

Control Type: ☑ Gate ☑ Valve ☐ Other _____

Location: ☐ Control on Upstream side ☐ Control on Downstream side

Seepage: ☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☒ Not Visible ☑ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

☐ a. The outlet works were not inspected.

☐ b. The outlet works were not tested.

☑ c. The outlet works appeared to be in satisfactory condition, no corrective actions are required at this time.

☑ d. The outlet works appeared to be in fair to poor condition and requires corrective action.

☐ e. The outlet works appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ f. Seepage/Ponding water was observed. Conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.

☐ g. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area. Failures caused by seepage/piping along the outlet conduit are very common and are considered to be a dangerous situation.

☐ h. Were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

☐ i. _____

☐ j. _____

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10. Spillway:

Type: ☐ None ☐ Culvert/Pipe ☑ Channel

Description: _____

Dimension: ~10' ft. Invert elevation: _____ ft. per staff gage

Slope Protection: ☑ None ☐ Grass ☐ Dumped Rock ☐ Fitted Rip Rap ☐ Grouted Rip Rap ☐ Concrete

☐ Defect in Protection: Description: _____

Approach: ☑ Clear ☐ High Veg. ☐ Trees ☐ Other: _____

Erosion: ☐ Scour ☑ Gully ☐ Headcut ☐ Not Observed ☐ Other: Erosion on both side of wing wall and headwall

Description: one wing wall missing

Vegetation: ☑ None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: _____

Findings:

☐ a. The Spillway appeared to be in satisfactory condition, no corrective actions are required at this time.

☑ b. The Spillway appeared to be in fair to poor condition and requires corrective action.

☐ c. The Spillway appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☑ d. Slope protection needs maintenance or repair. Description: _____

☐ e. The spillway approach was blocked. Clear approach.

☑ f. Severe scour erosion was observed which requires maintenance and/or repair.
Description: Down stream

☐ g. A headcut (vertical drop in channel due to erosion) was observed downstream of the spillway. Corrective action is required to prevent this problem from moving upstream.

☐ h. Trees are unacceptable in the spillway channel and approach. Take corrective action to address the woody vegetation problem and repair the damaged area.

☐ i. Unclear if spillway is adequately sized. Spillway should pass the probable maximum flood. Verify spillway capacity and take corrective action as required.

☑ j. Monitor deep erosion

11. Down Stream Channel:

Name: _____

Downstream: ☐ Sump ☐ Open Area ☐ Un-Defined Drainage-way ☐ Defined Drainage-way ☐ Other _____

Items along Stream Bank: ☐ None ☐ Road ☐ Houses ☐ Town ☐ Not Inspected

Description: _____

Findings:

☑ a. The downstream channel was not inspected.

☐ b. The downstream channel appeared to be in satisfactory condition, no corrective actions are required at this time.

☐ c. The downstream channel appeared to be in fair to poor condition and requires corrective action.

☐ d. The downstream channel appeared to be in unsatisfactory condition and not expected to fulfill its intended function. Urgent corrective action is required.

Corrective Actions:

☐ e. _____

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Additional Comments:

On the date of this limited visual inspection, there appeared to be no immediate threat to the safety of the dam. No assurance can be made regarding the dam's condition after this date. Subsequent adverse weather and other factors may affect the dam's condition.

Limitations and Intent of this Dam Safety Inspection:

This Dam Safety Inspection was conducted to assess the general overall condition of the reservoir/dam, identify visible deficiencies, and recommend areas of for monitoring, additional investigative studies and corrective actions. The inspection is based only on visible features/areas of the dam on the day of inspection. This inspection is not a formal phase I or phase II dam safety inspection and does not include a review or evaluation from each specialist of an inspection team, such as a geologists, civil, geotechnical, structural, or hydraulics engineer. The owner should verify the findings of this report and take corrective actions. The owner may submit to the State alternative corrective actions that are certified by a licensed professional engineer in the State of Hawaii experienced in the design and construction of dams. This inspection does not relieve the owner/operator from their responsibility to conduct routine inspections, maintenance, repairs, modifications, monitoring, documentation, and/or investigative studies. The inspection was conducted under the authority of the Hawaii Revised Statures Chapter 179D, and Hawaii Administrative Rules, Title 13, Chapter 190, titled "Dams and Reservoirs". Questions regarding this inspection should be forwarded to the Hawaii State Dam Safety Program; PO Box 373; Honolulu, Hawaii 96809; Ph. (808) 587-0236.

Revised: Dec. 1, 2003